STIC Search Report
Biotech-Chem Library

STIC Database Tracking Number: 168608

TO: Paul Martin **Location: 4b71 / 3c18** **Tuesday, October 18, 2005** **Art Unit: 1655** **Phone: 571-272-3348** **Serial Number: 10 / 748335**	**From: Jan Delaval** **Location: Biotech-Chem Library** **Remsen 1a51** **Phone: 571-272-2504** **jan.delaval@uspto.gov**

Search Notes

ACCESS DB # 168608

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Scientific and Technical Information Center

SEARCH REQUEST FORM

Requester's Full Name: Paul Martin Examiner #: 81449 Date: 10/14/05
Art Unit: 1655 Phone Number: 2-3348 Serial Number: 10748335
Location (Bldg/Room#): _____ (Mailbox #): _____ Results Format Preferred (circle): PAPER DISK
****

To ensure an efficient and quality search, please attach a copy of the cover sheet, claims, and abstract or fill out the following:

Title of Invention: Identification of Active site inhibitors of glycosyltransferases using a generalizable high throughput screen
Inventors (please provide full names): Suzanne Walker Kahne, Daniel Kahne

Earliest Priority Date: 12/30/02

Search Topic:
Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc., if known.

For Sequence Searches Only *Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please search claim 11

fluorescein labeled UDP-GlcNAc hexose analog (N-acetylglucosamine)

used in glycosyltransferase binding assay or substrate polarization (murG)

displacement assay

****

STAFF USE ONLY

Searcher: Joan
Searcher Phone #: 22504
Searcher Location: _____
Date Searcher Picked Up: 10/18/05
Date Completed: 10/18/05
Searcher Prep & Review Time: 10
Online Time: 135

Type of Search

_____ NA Sequence (#)
_____ AA Sequence (#)
✓ Structure (#)
_____ Bibliographic
_____ Litigation
_____ Fulltext
_____ Other

Vendors and cost where applicable

✓ STN _____ Dialog
_____ Questel/Orbit _____ Lexis/Nexis
_____ Westlaw _____ WWW/Internet

___In-house sequence systems
___Commercial ___Oligomer ___Score/Length
___Interference ___SPDI ___Encode/Transl
_____ Other (specify)

9

STIC SEARCH RESULTS FEEDBACK FORM

Biotech-Chem Library

Questions about the scope or the results of the search? Contact ***the searcher or contact***:

Mary Hale, Information Branch Supervisor
308-4258, CM1-1E01

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1610*
- *Relevant prior art **found**, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
  (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found**:*
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to STIC/Biotech-Chem Library CM1 – Circ. Desk

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=> d his

     (FILE 'HOME' ENTERED AT 15:03:15 ON 18 OCT 2005)
               SET COST OFF

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L2           117 S E3-E7
               E KAHNE S/AU
L3             8 S E4,E5
               E WALKER S/AU
L4           210 S E3
L5            20 S E17
               E WALKER SUE/AU
L6            48 S E21
               SEL RN L1

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L8             4 S L7 AND (OC5-C6-C6 OR OC4-OC5-C6-C6-C6)/ES
L9             2 S L8 AND OC5/ES
L10            1 S L9 AND NCNC3/ES
L11        75563 S (OC5-C6-C6 OR OC4-OC5-C6-C6-C6)/ES
L12         1637 S L11 AND OC5/ES
L13          103 S L12 AND (OC4 AND NCNC3)/ES
L14           91 S L13 AND P/ELS
L15           28 S L14 AND 8/NR
L16           17 S L15 NOT S/ELS
L17            1 S L16 AND C38H38N4O23P2
L18            2 S L8 AND OC4-OC5-C6-C6-C6/ES NOT L9
L19            1 S L18 NOT N/ELS
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               E N-ACT5EYLGLUCOSAMINE/CN
               E N-ACETYLGLUCOSAMINE/CN
L21            1 S E3
               E C38H38N4O23P2/MF

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L26        25115 S FLUORESCEIN?
L27        25589 S L25,L26
L28         2084 S L20
L29        16687 S UDP OR URID?(L)DIHYDROGEN(L)?PHOSPH?
L30        16657 S UDP OR URID?(L)?PHOSPH?(L)GLUCORON?
L31         4962 S URID?(L)DIPHOSPH?
L32           40 S L27 AND L28-L31
L33         5969 S L21
L34        25484 S ?ACETYLGLUCOSAMIN? OR ?ACETY?(L)?GLUCOSAMIN?
L35            9 S L32 AND L33,L34

     FILE 'REGISTRY' ENTERED AT 15:25:37 ON 18 OCT 2005
L36            1 S 528-04-1

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L42           5 S L23,L41
L43           2 S L1-L6 AND L42
L44           5 S L42,L43
L45           2 S L44 AND GLCNAC
L46           5 S L44,L45

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L47           1 S L17

=> fil uspatall
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CA INDEXING COPYRIGHT (C) 2005 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPAT2' ENTERED AT 15:29:46 ON 18 OCT 2005
CA INDEXING COPYRIGHT (C) 2005 AMERICAN CHEMICAL SOCIETY (ACS)

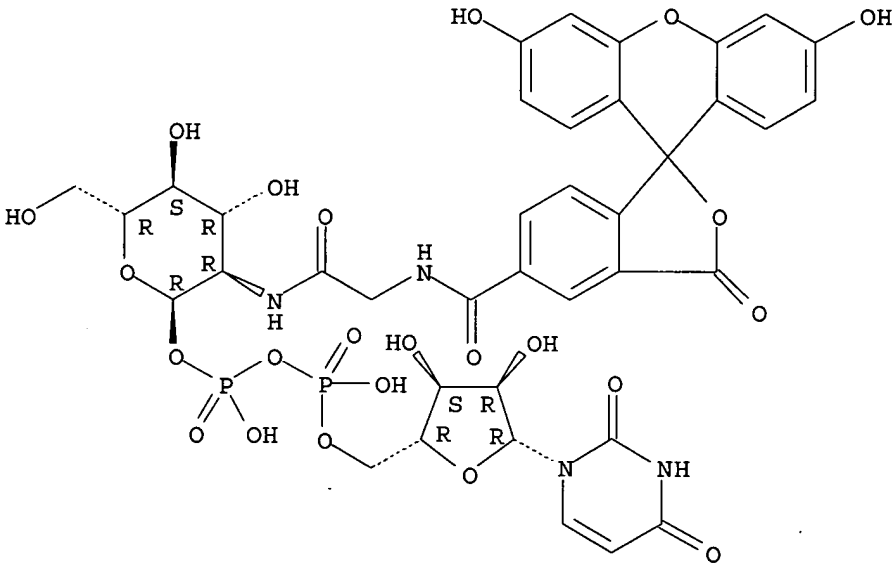
=> d 147 bib abs hitstr

L47  ANSWER 1 OF 1  USPATFULL on STN
AN     2005:165205  USPATFULL
TI     Identification of active-site inhibitors of glycosyltransferases using a
       generalizable high-throughput screen
IN     Kahne, Suzanne Walker, Princeton, NJ, UNITED STATES
       Kahne, Daniel, Princeton, NJ, UNITED STATES
PI     US 2005142629      A1   20050630
AI     US 2003-748335     A1   20031230 (10)
DT     Utility
FS     APPLICATION
LREP   Patrick H. Higgins, Mathews, Collins, Shepherd & McKay, Suite 306, 100
       Thanet Circle, Princeton, NJ, 08540, US
CLMN   Number of Claims: 20
ECL    Exemplary Claim: 1
DRWN   9 Drawing Page(s)
LN.CNT 1398
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB     A method is described for identifying a compound that modulates the
       ability of a glycosyltransferase to bind a substrate comprising
       combining a glycosyltransferase, a labeled substrate, and a compound, in
       a reaction vessel, under conditions known to be suitable for the
       glycosyltransferase to bind the labeled substrate, measuring an amount
       of labeled substrate bound to the glycosyltransferase, and comparing the
       amount to a standardized amount to identify a relative increase or
       decrease in substrate bound glycosyltransferase, thereby identifying a
       compound that modulates the ability of the glycosyltransferase to bind
       the substrate. A composition comprising an effective amount of a
       compound of Formula I (the substituents of which are described herein),
       or a stereoisomer, or pharmaceutically acceptable salt thereof, that
       inhibits the ability of a glycosyltransferase to bind a substrate, in a
       pharmaceutically acceptable carrier is provided    ##STR1##

CAS INDEXING IS AVAILABLE FOR THIS PATENT.
IT   608143-47-1P
       (glycosyltransferases inhibitor screening and use for controlling
       growth of bacteria)
```

RN 608143-47-1 USPATFULL
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-deoxy-2-[[[[(3',6'-dihydroxy-3-oxospiro[isobenzofuran-1(3H),9'-[9H]xanthen]-5-yl)carbonyl]amino]acetyl]amino]-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



=> fil hcaplus
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USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.
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FILE COVERS 1907 - 18 Oct 2005 VOL 143 ISS 17
FILE LAST UPDATED: 17 Oct 2005 (20051017/ED)

New CAS Information Use Policies, enter HELP USAGETERMS for details.

This file contains CAS Registry Numbers for easy and accurate substance identification.

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L59 ANSWER 1 OF 5 HCAPLUS COPYRIGHT 2005 ACS on STN
AN **2005:572457** HCAPLUS
DN **143:90985**
ED Entered STN: 01 Jul 2005
TI Identification of active-site inhibitors of glycosyltransferases using a generalizable high-throughput screen
IN **Kahne, Suzanne Walker; Kahne, Daniel**
PA USA
SO U.S. Pat. Appl. Publ., 26 pp.
CODEN: USXXCO
DT Patent
LA English
IC ICM C12Q001-48
INCL 435015000
CC 1-5 (Pharmacology)
Section cross-reference(s): 7, 33, 63
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI US 2005142629	A1	20050630	US 2003-748335	20031230 <--
PRAI US 2003-748335		20031230		

CLASS

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
US 2005142629	ICM	C12Q001-48
	INCL	435015000
US 2005142629	NCL	435/015.000 <--

OS MARPAT 143:90985
AB A method is described for identifying a compound that modulates the ability of a glycosyltransferase to bind a substrate, comprising combining a glycosyltransferase, a labeled substrate, and a compound, in a reaction vessel, under conditions known to be suitable for the glycosyltransferase to bind the labeled substrate, measuring an amount of labeled substrate bound to the glycosyltransferase, and comparing the amount to a standardized amount to identify a relative increase or decrease in substrate bound glycosyltransferase, thereby identifying a compound that modulates the ability of the glycosyltransferase to bind the substrate. A composition comprising an effective amount of a compound that inhibits the ability of a glycosyltransferase to bind a substrate, in a pharmaceutically acceptable carrier, is also provided. The invention further provides methods for controlling the growth of bacteria using the compds. of the invention. Compds. of the invention include e.g. 5-(4-tert-butylbenzylidene)-3-(4-methylpiperidin-1-ylmethyl)-2-thioxothiazolidin-4-one. Preparation of a **fluoresceinated UDP**-N-**acetylglucosamine** analog is included.
ST high throughput screen glycosyl transferase inhibitor antibacterial; thioxothiazolidinone deriv glycosyl transferase inhibitor antibacterial; **UDP acetylglucosamine** analog prepn glycosyl transferase inhibitor screening
IT Crystal structure
(MurG-bound **UDP-GlcNAc**; glycosyltransferases inhibitor screening and use for controlling growth of bacteria)
IT Peptidoglycans
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(bacterial peptidoglycan synthesis; glycosyltransferases inhibitor screening and use for controlling growth of bacteria)
IT Infection
(bacterial; glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT Antibacterial agents
Chromophores
Drug screening
Dyes
Fluorescent substances
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT Enzymes, biological studies
Radionuclides, biological studies
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT **58-98-0**, **UDP**, biological studies 146-91-8, GDP
491-97-4, TDP **528-04-1** 9023-27-2, Gene MurA enzyme
9033-07-2, Glycosyltransferase 60976-26-3, MurG glycosyltransferase
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT 58-64-0, ADP, biological studies **58-97-9**, UMP, biological studies **2321-07-5**, **Fluorescein**
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT **608143-47-1P**
RL: BUU (Biological use, unclassified); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT 292168-98-0 292168-98-0D, stereoisomers and salts 292169-21-2
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RL: PAC (Pharmacological activity); THU (Therapeutic use); BIOL (Biological study); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT 19286-16-9 108549-23-1 **117548-22-8**
RL: RCT (Reactant); RACT (Reactant or reagent)

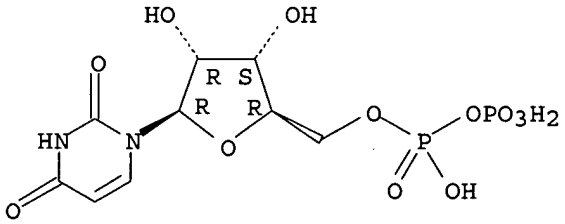
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT 856570-65-5P 856570-66-6P **856570-67-7P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

IT **58-98-0**, **UDP**, biological studies **528-04-1**
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

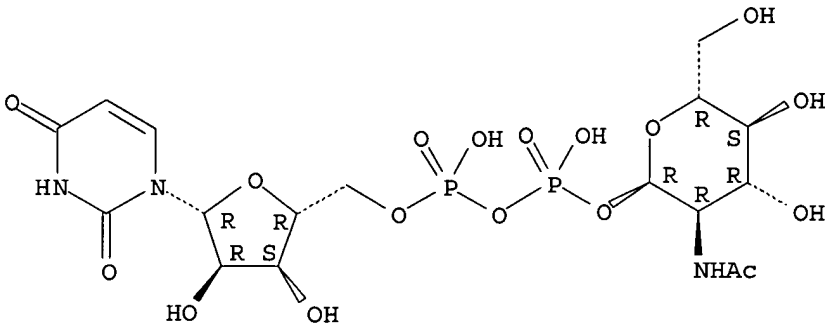
RN 58-98-0 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate) (9CI) (CA INDEX NAME)

Absolute stereochemistry.



RN 528-04-1 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-(acetylamino)-2-deoxy-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

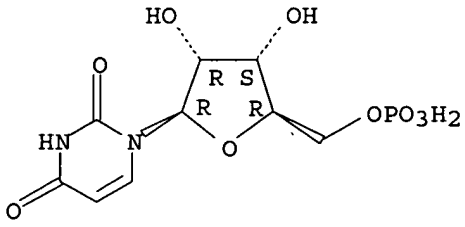
Absolute stereochemistry.



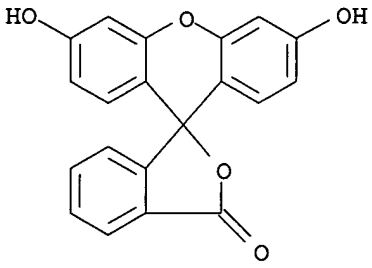
IT **58-97-9**, UMP, biological studies **2321-07-5**, **Fluorescein**
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)

RN 58-97-9 HCAPLUS
CN 5'-Uridylic acid (8CI, 9CI) (CA INDEX NAME)

Absolute stereochemistry.

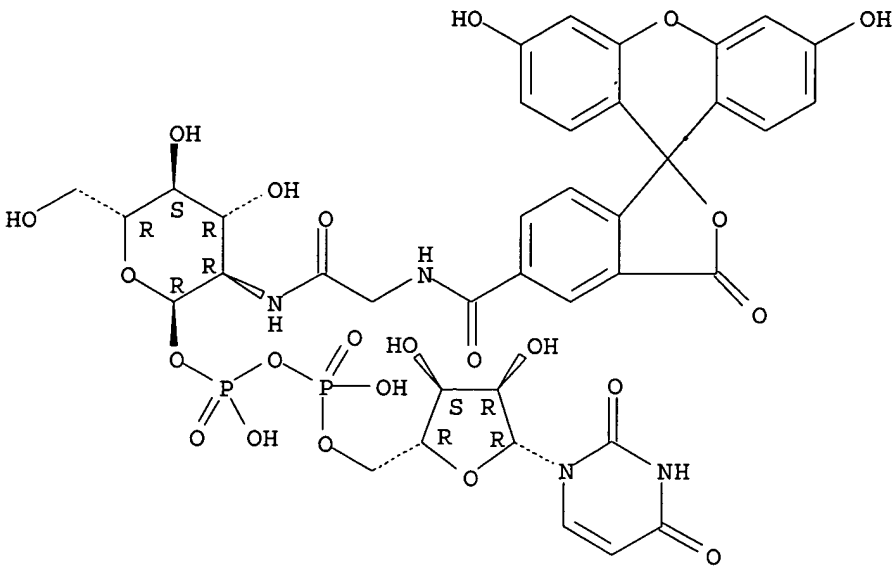


RN 2321-07-5 HCAPLUS
CN Spiro[isobenzofuran-1(3H),9'-[9H]xanthen]-3-one, 3',6'-dihydroxy- (9CI) (CA INDEX NAME)

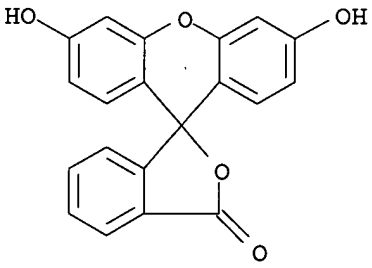


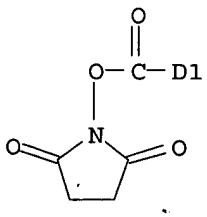
IT **608143-47-1P**
RL: BUU (Biological use, unclassified); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation); USES (Uses)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)
RN 608143-47-1 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-deoxy-2-[[[[(3',6'-dihydroxy-3-oxospiro[isobenzofuran-1(3H),9'-[9H]xanthen]-5-yl)carbonyl]amino]acetyl]amino]-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



IT **117548-22-8**
RL: RCT (Reactant); RACT (Reactant or reagent)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)
RN 117548-22-8 HCAPLUS
CN 2,5-Pyrrolidinedione, 1-[[[3',6'-dihydroxy-3-oxospiro[isobenzofuran-1(3H),9'-[9H]xanthen]-5(or 6)-yl]carbonyl]oxy]- (9CI) (CA INDEX NAME)

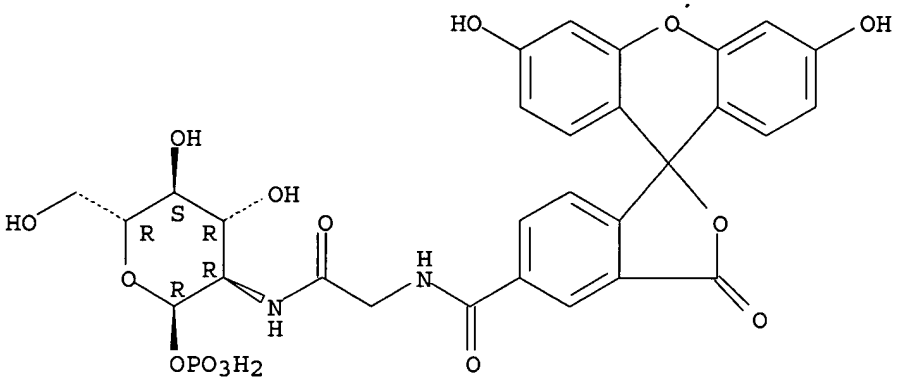




IT **856570-67-7P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(glycosyltransferases inhibitor screening and use for controlling growth of bacteria)
RN 856570-67-7 HCAPLUS
CN α-D-Glucopyranose, 2-deoxy-2-[[[[(3',6'-dihydroxy-3-

oxospiro[isobenzofuran-1(3H),9'-[9H]xanthen]-5-yl)carbonyl]amino]acetyl]amino]-, 1-(dihydrogen phosphate) (9CI) (CA INDEX NAME)

Absolute stereochemistry.



L59 ANSWER 2 OF 5 HCAPLUS COPYRIGHT 2005 ACS on STN
AN **2004:354961** HCAPLUS
DN **140:370523**
ED Entered STN: 30 Apr 2004
TI Synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into the protein
IN Schultz, Peter G.; Wang, Lei; Zhang, Zhiwen
PA The Scripps Research Institute, USA
SO PCT Int. Appl., 103 pp.
CODEN: PIXXD2
DT Patent
LA English
IC ICM C07K
CC 6-3 (General Biochemistry)
FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004035605	A2	20040429	WO 2003-US32870	20031015
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	US 2004138106	A1	20040715	US 2003-686944	20031015
	US 6927042	B2	20050809		
	EP 1558747	A2	20050803	EP 2003-777634	20031015
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	US 2005186656	A1	20050825	US 2005-93798	20050329
	US 2005186657	A1	20050825	US 2005-94676	20050329

	US 2005209133	A1	20050922	US 2005-93797	20050329
PRAI	US 2002-419265P	P	20021016		
	US 2002-420990P	P	20021023		
	US 2003-441450P	P	20030116		
	US 2003-686944	A3	20031015		
	WO 2003-US32870	W	20031015		

CLASS

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
WO 2004035605	ICM	C07K
WO 2004035605	ECLA	C12P021/00B
CA 2500653	ECLA	C12P021/00B
US 2004138106	NCL	514/008.000
EP 1558747	ECLA	C12P021/00B
US 2005181471	NCL	435/068.100; 530/395.000; 530/409.000
US 2005186656	NCL	435/068.100; 435/193.000; 530/395.000
US 2005186657	NCL	435/068.100; 435/193.000; 530/395.000
US 2005209133	NCL	514/008.000; 530/322.000

AB Methods for glycosidating proteins to give novel positions and patterns of glycosidation are described. One method involves incorporating an unnatural amino acid containing a reactive group into a protein and attaching one or more saccharide moieties to the unnatural amino acid. Another method involves incorporating an unnatural amino acid that includes a saccharide moiety into a protein. Proteins made by both methods can be further modified with addnl. sugars. Methods of introducing ketoamino acids into proteins during protein synthesis by means of tRNA variants charged with the amino acid and aminoacyl-tRNA synthetase derivs. capable of charging the tRNAs with ketoaminoacids are described. The tRNA recognizes a codon such as a stop codon, a rare codon, or a tetranucleotide or longer sequence that is rare in the gene of interest. A mutant Methanococcus jannaschii tyrosyl tRNA synthetase that could suppress amber mutations in a chloramphenicol acetyltransferase gene was selected and screened for growth on chloramphenicol in the presence p-acetyl-L-phenylalanine. Translation of genes containing amber mutations in the presence of this synthetase resulted in the introduction of the keto amino acid at the specific sites in the presence of an amer suppressor tRNA. The protein could be modified with **fluorescein** hydrazide and biotin hydrazide at the corresponding sites.

ST protein glycosidation translation amino acid analog reactive group; ketoamino acid protein synthesis tRNA synthetase variant; amino acid analog protein synthesis tRNA synthetase variant

IT tRNA
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(amber suppressor, incorporation of amino acid analogs using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Codons
RL: BSU (Biological study, unclassified); BIOL (Biological study)
(amber, suppression of, incorporation of amino acid analogs using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Nucleophiles
(amino acid analogs as, for glycosidation; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Glycosides
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(amino acid, incorporation into proteins of; synthetic glycosylation of

proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Amino acids, biological studies
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(analogs, incorporation into proteins of; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Escherichia coli
(expression host; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT DNA sequences
(for tyrosyl tRNA synthetase variants of Methanococcus jannaschii; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Amino acids, biological studies
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosides, incorporation into proteins of; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Translation, genetic
(incorporation of unnatural amino acids in; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Protein engineering
(of aminoacyl-tRNA synthetases; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Glycosylation
(of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Genetic engineering
Molecular cloning
(synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Glycoproteins
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT tRNA
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(tyrosine-specific, variants, for introduction of amino acid analogs; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT Methanococcus jannaschii
(tyrosyl tRNA synthetase of; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 60063-85-6, Galacturonyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(Galacturonyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 9054-44-8, N-Acetylgalactosaminyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)

(acetylgalactosaminyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 684302-79-2 684302-80-5 684302-81-6 684302-82-7 684302-83-8 684302-84-9
RL: BSU (Biological study, unclassified); BUU (Biological use, unclassified); PRP (Properties); BIOL (Biological study); USES (Uses)
(amino acid sequence; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 61652-90-2DP, protein conjugates 70858-45-6DP, protein conjugates 71369-21-6DP, protein conjugates 81034-76-6DP, protein conjugates 84808-02-6DP, protein conjugates
RL: BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)
(enzymic preparation in protein glycosidation; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 9023-45-4D, Tyrosyl tRNA synthetase, variants
RL: BUU (Biological use, unclassified); PRP (Properties); BIOL (Biological study); USES (Uses)
(for charging tRNA with amino acid analogs; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 57534-80-2, Glucuronic acid transferase 192588-73-1, Glycoprotein glucuronyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 56626-18-7, Fucosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(fucosyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 9031-68-9, Galactosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(galactosyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 9031-48-5, Glucosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glucosyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT **7512-17-6**, N-**Acetylglucosamine**
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosidation of proteins at; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT **528-04-1 2956-16-3**, **UDP**-galactose 3123-67-9, GDP-mannose 9054-94-8, β-1,4-Galactosyltransferase 83744-93-8 135622-87-6 193099-05-7 202420-38-0 334993-76-9
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)

(glycosidation of proteins using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 17041-36-0 21008-33-3 67315-18-8 685088-58-8
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(incorporation into proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 22888-49-9P
RL: BUU (Biological use, unclassified); SPN (Synthetic preparation); BIOL (Biological study); PREP (Preparation); USES (Uses)
(introduction into proteins of; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 9055-06-5, Mannosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(mannosyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 684302-85-0 684302-86-1 684302-87-2 684302-88-3
RL: BSU (Biological study, unclassified); BUU (Biological use, unclassified); PRP (Properties); BIOL (Biological study); USES (Uses)
(nucleotide sequence; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 66640-86-6, Biotin hydrazide **109653-47-6**, **Fluorescein** hydrazide
RL: RCT (Reactant); RACT (Reactant or reagent)
(protein modification with; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 78-67-1, AIBN 122-00-9 128-08-5, N-Bromosuccinimide 1068-90-2, Diethyl acetamidomalonate 204716-07-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(reactions of; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 321976-25-4, Sialyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(sialyltransferase, for glycosidation of proteins; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 56093-23-3, α-1,2 Fucosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(α-1,2-fucosyltransferase, glycosidation of proteins using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

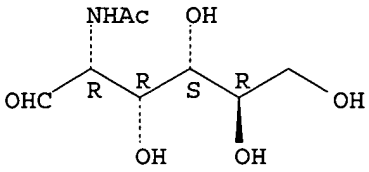
IT 68247-53-0, α(1,3)-Fucosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(α-1,3-fucosyltransferase, glycosidation of proteins using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

IT 111310-37-3, α(1,4)-Fucosyltransferase
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(α-1,4-fucosyltransferase, glycosidation of proteins using;

synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)

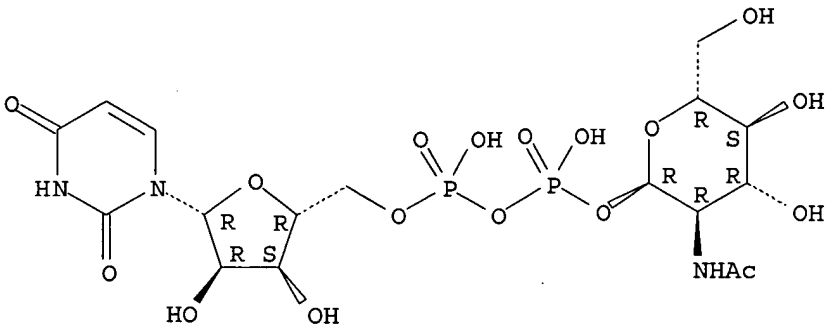
IT **7512-17-6, N-Acetylglucosamine**
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosidation of proteins at; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)
RN 7512-17-6 HCAPLUS
CN D-Glucose, 2-(acetylamino)-2-deoxy- (9CI) (CA INDEX NAME)

Absolute stereochemistry.



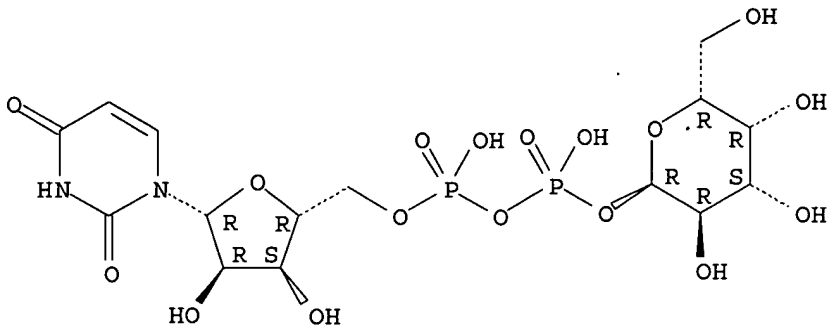
IT **528-04-1 2956-16-3, UDP-galactose**
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(glycosidation of proteins using; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)
RN 528-04-1 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-(acetylamino)-2-deoxy-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.

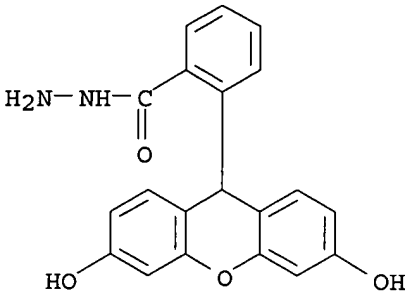


RN 2956-16-3 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-α-D-galactopyranosyl ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



IT **109653-47-6**, **Fluorescein** hydrazide
RL: RCT (Reactant); RACT (Reactant or reagent)
(protein modification with; synthetic glycosylation of proteins by incorporation of unnatural amino acids with novel reactive groups into protein)
RN 109653-47-6 HCAPLUS
CN Benzoic acid, 2-(3,6-dihydroxy-9H-xanthen-9-yl)-, hydrazide (9CI) (CA INDEX NAME)



L59 ANSWER 3 OF 5 HCAPLUS COPYRIGHT 2005 ACS on STN
AN 2003:652522 HCAPLUS
DN 139:285735
ED Entered STN: 22 Aug 2003
TI Identification of Active-Site Inhibitors of MurG Using a Generalizable, High-Throughput Glycosyltransferase Screen
AU Helm, Jeremiah S.; Hu, Yanan; Chen, Lan; Gross, Ben; **Walker, Suzanne**
CS Department of Chemistry, Princeton University, Princeton, NJ, 08544, USA
SO Journal of the American Chemical Society (2003), 125(37), 11168-11169
CODEN: JACSAT; ISSN: 0002-7863
PB American Chemical Society
DT Journal
LA English
CC 1-5 (Pharmacology)
Section cross-reference(s): 7, 10
AB MurG is a glycosyltransferase involved in the biosynthesis of bacterial peptidoglycan. It is a potentially important antibiotic target, but no inhibitors of the enzyme have been reported. In general, inhibitors of glycosyltransferases have been difficult to design. Furthermore, no glycosyltransferase inhibitors have been identified through

high-throughput screening, perhaps because appropriate screens for glycosyltransferase inhibition have not been developed. In this manuscript, the authors describe the development of a high-throughput screen for MurG that was used to screen a 50 000 compound library for inhibitors. The screen, which can be generalized to other glycosyltransferases, led to the identification of a family of active-site directed MurG inhibitors. The family of inhibitors contains a five-membered heterocyclic core that appears to function as a diphosphate mimic with respect to the presentation of substituents. The authors discuss the implications of this result and the utility of the screen for identifying inhibitors of other glycosyltransferases.

ST MurG glycosyltransferase inhibitor identification high throughput screen

IT Antibacterial agents
Combinatorial library
Drug screening
High throughput screening
(identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

IT Enzyme functional sites
(inhibitor-binding; identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

IT Enzyme kinetics
(of inhibition; identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

IT **608143-47-1**
RL: BUU (Biological use, unclassified); PAC (Pharmacological activity); BIOL (Biological study); USES (Uses)
(displacement ligand; identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

IT 60976-26-3, MurG glycosyltransferase
RL: BSU (Biological study, unclassified); BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)
(identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

IT 312501-65-8
RL: PAC (Pharmacological activity); BIOL (Biological study)
(identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

RE.CNT 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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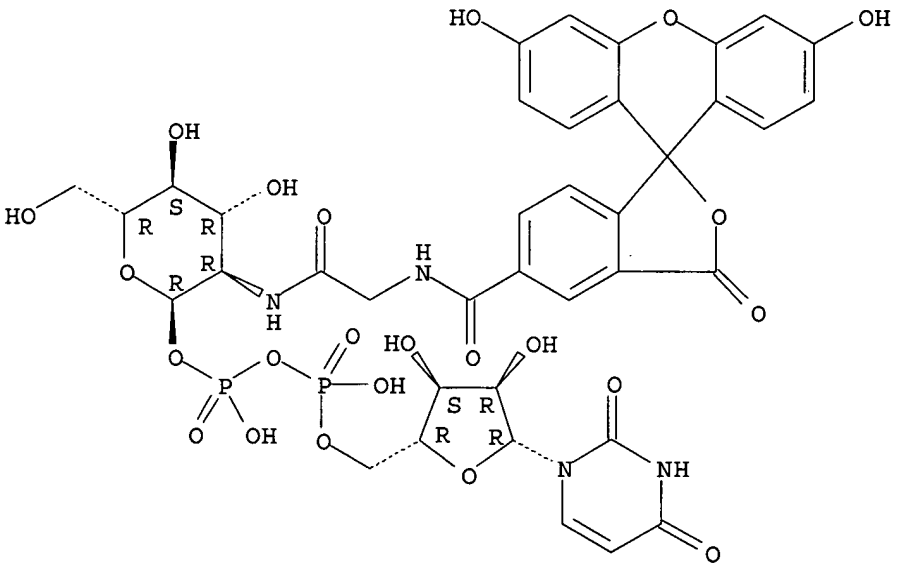
IT **608143-47-1**
RL: BUU (Biological use, unclassified); PAC (Pharmacological activity); BIOL (Biological study); USES (Uses)
(displacement ligand; identification of active-site inhibitors of MurG using a generalizable high-throughput glycosyltransferase screen in relation to antibacterial activity)

RN 608143-47-1 HCAPLUS

CN Uridine 5'-(trihydrogen diphosphate), P'-[2-deoxy-2-[[[[(3',6'-dihydroxy-3-oxospiro[isobenzofuran-1(3H),9'-[9H]xanthen]-5-yl)carbonyl]amino]acetyl]amino]-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



L59 ANSWER 4 OF 5 HCAPLUS COPYRIGHT 2005 ACS on STN
AN **1996:367026** HCAPLUS
DN **125:50470**
ED Entered STN: 25 Jun 1996
TI Molecular cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis
AU Abeijon, Claudia; Robbins, Phillips W.; Hirschberg, Carlos B.
CS Dep. Biochem. Mol. Biol., Univ. Massachusetts Med. Cent., Worcester, MA, 01655, USA

SO Proceedings of the National Academy of Sciences of the United States of America (1996), 93(12), 5963-5968
CODEN: PNASA6; ISSN: 0027-8424
PB National Academy of Sciences
DT Journal
LA English
CC 3-3 (Biochemical Genetics)
Section cross-reference(s): 6, 10

AB The mannan chains of Kluyveromyces lactis mannoproteins are similar to those of Saccharomyces cerevisiae except that they lack mannose phosphate and have terminal α1→2-linked N- **acetylglucosamine.** The biosynthesis of these chains probably occurs in the human of the Golgi apparatus, by analogy to S. cerevisiae. The sugar donors, GDP-mannose and **UDP-GlcNAc**, must first be transported from the cytosol, their site of synthesis, via specific Golgi membrane transporters into the lumen where they are substrates in the biosynthesis of these mannoproteins. A mutant of K. lactis, mnn2-2, that lacks terminal N-**acetylglucosamine** in its mannan chains in vivo, has recently been characterized and shown to have a specific defect in transport of **UDP-GlcNAc** into the lumen of Golgi vesicles in vitro. We have now cloned the gene encoding the K. lactis Golgi membrane **UDP-GlcNAc** transporter by complementation of the mnn2-2 mutation. The mnn2-2 mutant was transformed with a genomic library from wild-type K. lactis in a pKD1-derived vector; transformants were isolated and phenotypic correction was monitored following cell surface labeling with **fluorescein** isothiocyanate conjugated to Griffonia simplicifolia II lectin, which binds terminal N-**acetylglucosamine** , and a fluorescent activated cell sorter. A 2.4-kb DNA fragment was found to restore the wild-type lectin binding phenotype. Upon loss of the plasmid containing this fragment, reversion to the mutant phenotype occurred. The above fragment contained an open reading frame for a multitransmembrane spanning protein of 328 amino acids. The protein contains a leucine zipper motif and has high homol. to predicted proteins from S. cerevisiae and C. elegans. In an assay in vitro, Golgi vesicles isolated from the transformant had regained their ability to transport **UDP-GlcNAc.** Taken together, the above results strongly suggest that the cloned gene encodes the golgi **UDP-GlcNAc** transporter of K. lactis.

ST Kluyveromyces Golgi **uridine diphosphate acetylglucosamine** transporter; **uridine diphosphate acetylglucosamine** transporter gene sequence

IT Cell membrane
(2.4-kb DNA fragment which was found to restore the wild-type lectin binding phenotype to Kluyveromyces lactis mnn2-2 mutant contained an open reading frame for a multitransmembrane spanning protein of 328 amino acids)

IT Complementation, genetic
(gene encoding the Kluyveromyces lactis Golgi membrane **UDP-GlcNAc** transporter has been cloned by complementation of the mnn2-2 mutation)

IT Mutation
(mnn2-2; gene encoding the Kluyveromyces lactis Golgi membrane **UDP-GlcNAc** transporter has been cloned by complementation of the mnn2-2 mutation)

IT Golgi apparatus
Kluyveromyces lactis
Molecular cloning
(mol. cloning of the Golgi apparatus **uridine diphosphate** -N-**acetylglucosamine** transporter from Kluyveromyces lactis)

IT Protein sequences

(of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

IT Deoxyribonucleic acid sequences
(of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter gene from Kluyveromyces lactis)

IT Plasmid and Episome
(upon loss of the plasmid containing the 2.4-kb DNA fragment which was found to restore the wild-type lectin binding phenotype to Kluyveromyces lactis mnn2-2 mutant, reversion to the mutant phenotype occurred)

IT Proteins, specific or class
RL: BPR (Biological process); BSU (Biological study, unclassified); BIOL (Biological study); PROC (Process)
(**UDP**-N-**acetylglucosamine**-transporting, mol. cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

IT Conformation and Conformers
(leucine zipper, protein which was found to restore the wild-type lectin binding phenotype to Kluyveromyces lactis mnn2-2 mutant contains a leucine zipper motif and has high homol. to predicted proteins from S. cerevisiae and C. elegans)

IT 178235-60-4
RL: PRP (Properties)
(amino acid sequence; mol. cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

IT **528-04-1, Uridine diphosphate**-N-**acetylglucosamine**
RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); PRP (Properties); BIOL (Biological study)
(mol. cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

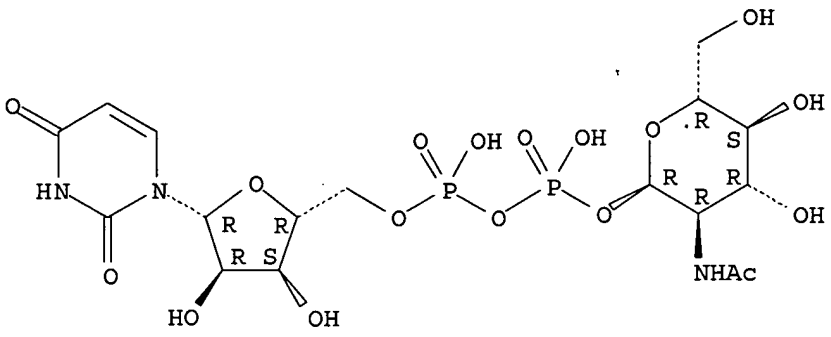
IT 177526-16-8, GenBank U48413
RL: PRP (Properties)
(nucleotide sequence; mol. cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

IT **528-04-1, Uridine diphosphate**-N-**acetylglucosamine**
RL: BAC (Biological activity or effector, except adverse); BSU (Biological study, unclassified); PRP (Properties); BIOL (Biological study)
(mol. cloning of the Golgi apparatus **uridine diphosphate**-N-**acetylglucosamine** transporter from Kluyveromyces lactis)

RN 528-04-1 HCAPLUS

CN Uridine 5'-(trihydrogen diphosphate), P'-[2-(acetylamino)-2-deoxy-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



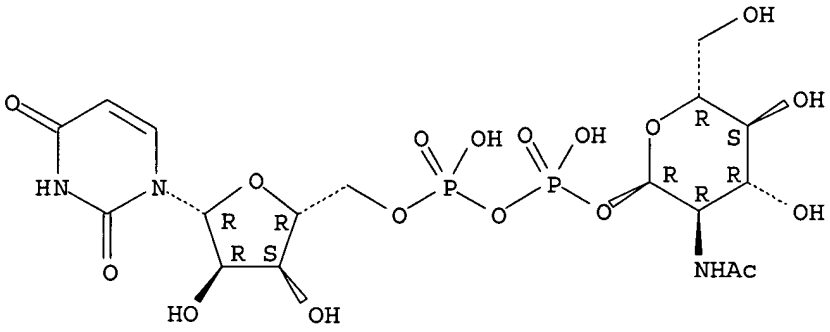
L59 ANSWER 5 OF 5 HCAPLUS COPYRIGHT 2005 ACS on STN
AN **1988:525962** HCAPLUS
DN **109:125962**
ED Entered STN: 14 Oct 1988
TI Metabolism of D-[U-14C]glucosamine in seedlings of Calluna vulgaris (L.) Hull
AU Piro, G.; Perotto, S.; Bonfante-Fasolo, P.; Dalessandro, G.
CS Dip. Biol., Univ. Stud. Lecce, Lecce, I-73100, Italy
SO Journal of Plant Physiology (1988), 132(6), 695-701
CODEN: JPPHEY; ISSN: 0176-1617
DT Journal
LA English
CC 11-2 (Plant Biochemistry)
AB Exogenous D-[U-14C]**glucosamine** was taken up by roots of C. vulgaris seedlings, translocated throughout the plant and metabolized to N-**acetyl**-D-**glucosamine**, N-**acetyl**-D-**glucosamine** 6-phosphate, N-**acetyl**-D-**glucosamine** 1-phosphate, **UDP**-N-**acetyl**-D-**glucosamine** and **UDP**-N-**acetyl**-D-galactosamine. The N-**acetyl**-D-hexosamine nucleosides acted as glycosyl donors of polymers containing N-**acetyl**-D-**glucosamine** and N-**acetyl**-D-galactosamine residues. The presence of N-**acetyl**-D-**glucosamine** residues at the surface of hair roots was shown by using wheat germ agglutinin linked to **fluorescein** isothiocyanate or colloidal gold as specific probes.
ST Calluna glucosamine metab
IT Root
(**acetylglucosamine** residues at surface of, localization of)
IT Glycoproteins, biological studies
RL: BIOL (Biological study)
(glucosamine incorporation in, in Calluna vulgaris seedlings)
IT Calluna vulgaris
(glucosamine metabolism in seedlings of)
IT Translocation
(of glucosamine in Calluna vulgaris seedlings)
IT **528-04-1**, **UDP**-N-**acetyl**-D-**glucosamine** **1746-32-3**, N-**Acetyl**-D-**glucosamine** 6-phosphate **6866-69-9** **7277-98-7**, **UDP**-N-**acetyl**-D-galactosamine **7512-17-6**, N-**Acetyl**-D-**glucosamine**
RL: FORM (Formation, nonpreparative)
(formation of, from **glucosamine**, in Calluna vulgaris seedings)
IT 3416-24-8, D-Glucosamine

RL: BPR (Biological process); BSU (Biological study, unclassified); BIOL (Biological study); PROC (Process)
(metabolism of, in Calluna vulgaris seedlings)

IT **528-04-1**, **UDP**-N-**acetyl**-D-**glucosamine**
1746-32-3, N-**Acetyl**-D-**glucosamine** 6-phosphate
6866-69-9 **7277-98-7**, **UDP**-N-**acetyl**
-D-galactosamine **7512-17-6**, N-**Acetyl**-D-
glucosamine
RL: FORM (Formation, nonpreparative)
(formation of, from **glucosamine**, in Calluna vulgaris seedings)

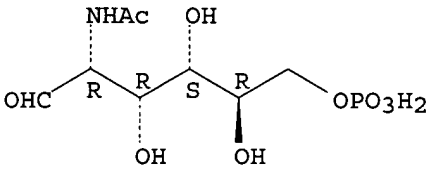
RN 528-04-1 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-(acetylamino)-2-deoxy-α-D-glucopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



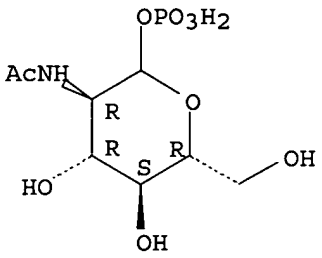
RN 1746-32-3 HCAPLUS
CN D-Glucose, 2-(acetylamino)-2-deoxy-, 6-(dihydrogen phosphate) (9CI) (CA INDEX NAME)

Absolute stereochemistry.



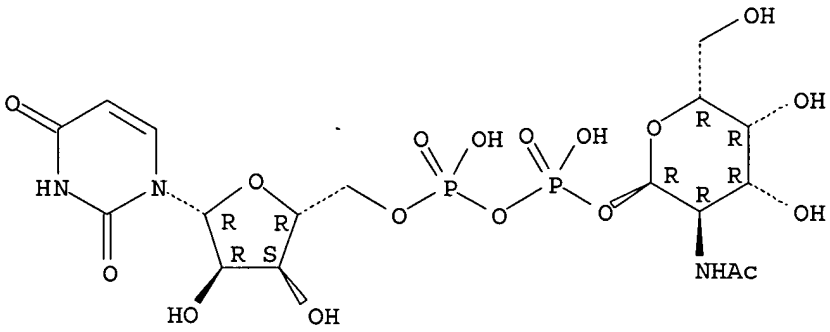
RN 6866-69-9 HCAPLUS
CN D-Glucopyranose, 2-(acetylamino)-2-deoxy-, 1-(dihydrogen phosphate) (9CI) (CA INDEX NAME)

Absolute stereochemistry.



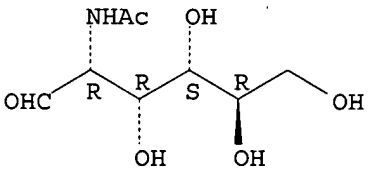
RN 7277-98-7 HCAPLUS
CN Uridine 5'-(trihydrogen diphosphate), P'-[2-(acetylamino)-2-deoxy-α-D-galactopyranosyl] ester (9CI) (CA INDEX NAME)

Absolute stereochemistry.



RN 7512-17-6 HCAPLUS
CN D-Glucose, 2-(acetylamino)-2-deoxy- (9CI) (CA INDEX NAME)

Absolute stereochemistry.



=> d his

(FILE 'HOME' ENTERED AT 15:03:15 ON 18 OCT 2005)
SET COST OFF

FILE 'HCAPLUS' ENTERED AT 15:03:41 ON 18 OCT 2005
L1 1 S US20050142629/PN OR US2003-784335#/AP,PRN
E KAHNE D/AU
L2 117 S E3-E7
E KAHNE S/AU
L3 8 S E4,E5
E WALKER S/AU
L4 210 S E3

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L5          20 S E17
               E WALKER SUE/AU
L6          48 S E21
               SEL RN L1

     FILE 'REGISTRY' ENTERED AT 15:05:45 ON 18 OCT 2005
L7          48 S E1-E48
L8           4 S L7 AND (OC5-C6-C6 OR OC4-OC5-C6-C6-C6)/ES
L9           2 S L8 AND OC5/ES
L10          1 S L9 AND NCNC3/ES
L11      75563 S (OC5-C6-C6 OR OC4-OC5-C6-C6-C6)/ES
L12       1637 S L11 AND OC5/ES
L13        103 S L12 AND (OC4 AND NCNC3)/ES
L14         91 S L13 AND P/ELS
L15         28 S L14 AND 8/NR
L16         17 S L15 NOT S/ELS
L17          1 S L16 AND C38H38N4O23P2
L18          2 S L8 AND OC4-OC5-C6-C6-C6/ES NOT L9
L19          1 S L18 NOT N/ELS
L20          1 S 58-98-0
               E N-ACT5EYLGLUCOSAMINE/CN
               E N-ACETYLGLUCOSAMINE/CN
L21          1 S E3
               E C38H38N4O23P2/MF

     FILE 'HCAOLD' ENTERED AT 15:16:10 ON 18 OCT 2005
L22          0 S L17

     FILE 'HCAPLUS' ENTERED AT 15:16:14 ON 18 OCT 2005
L23          2 S L17
L24          0 S L19 AND L20 AND L21
L25       6310 S L19
L26      25115 S FLUORESCEIN?
L27      25589 S L25,L26
L28       2084 S L20
L29      16687 S UDP OR URID?(L)DIHYDROGEN(L)?PHOSPH?
L30      16657 S UDP OR URID?(L)?PHOSPH?(L)GLUCORON?
L31       4962 S URID?(L)DIPHOSPH?
L32         40 S L27 AND L28-L31
L33       5969 S L21
L34      25484 S ?ACETYLGLUCOSAMIN? OR ?ACETY?(L)?GLUCOSAMIN?
L35          9 S L32 AND L33,L34

     FILE 'REGISTRY' ENTERED AT 15:25:37 ON 18 OCT 2005
L36          1 S 528-04-1

     FILE 'HCAPLUS' ENTERED AT 15:25:47 ON 18 OCT 2005
L37       1276 S L36
L38          7 S L37 AND L27
L39          1 S L38 NOT L35
               SEL DN AN L35 2 4 8 9
L40          4 S E1-E12 AND L35
L41          4 S L37 AND L40
L42          5 S L23,L41
L43          2 S L1-L6 AND L42
L44          5 S L42,L43
L45          2 S L44 AND GLCNAC
L46          5 S L44,L45

     FILE 'USPATFULL, USPAT2' ENTERED AT 15:29:27 ON 18 OCT 2005
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L47           1 S L17

     FILE 'USPATFULL, USPAT2' ENTERED AT 15:29:46 ON 18 OCT 2005

     FILE 'HCAPLUS' ENTERED AT 15:29:53 ON 18 OCT 2005
               SEL RN L46

     FILE 'REGISTRY' ENTERED AT 15:30:24 ON 18 OCT 2005
L48         103 S E13-E115
L49           4 S L48 AND OC4-OC5-C6-C6-C6/ES
L50           1 S L48 AND L36
L51           4 S L48 AND L10,L17,L19,L20,L21
L52           7 S L49-L51
L53           6 S L48 AND (NCNC3 AND OC4)/ES NOT L52
L54           3 S L53 NOT (THYMIDINE OR C6/ES)
L55          10 S L52,L54
L56          90 S L48 NOT L49-L55
L57           3 S L56 AND (C8H16NO9P OR C20H16N2O4)
L58          13 S L55,L57

     FILE 'HCAPLUS' ENTERED AT 15:36:01 ON 18 OCT 2005
L59           5 S L58 AND L46

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